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Author: Dr. Johan de Vries
Airbus Defence and Space Netherlands B.V., The Netherlands, j.de.vries@dutchspace.nl

Mr. Frits Teule
Airbus Defence and Space Netherlands B.V., The Netherlands, f.teule@dutchspace.nl
Mr. Sytze Kampen
Airbus Defence and Space Netherlands B.V., The Netherlands, s.kampen@dutchspace.nl
Dr. Robert Voors
Airbus Defence and Space Netherlands B.V., The Netherlands, r.voors@dutchspace.nl
Dr. Jos Dingjan
Airbus Defence and Space Netherlands B.V., The Netherlands, j.dingjan@dutchspace.nl
Dr. Andrew Court
TNO, The Netherlands, andy.court@tno.nl
Mr. Hans Bol
TNO Space, The Netherlands, Hans.Bol@TNO.nl
Dr. Ruud Hoogeveen
SRON - Netherlands Institute for Space Research, The Netherlands, R.W.M.Hoogeveen@sron.nl
Dr. Pepijn Veefkind
KNMI, The Netherlands, veefkind@knmi.nl

EVOLUTION AND TRENDS IN ATMOSPHERIC SOLAR-BACKSCATTER INSTRUMENTS

Abstract

For many years, instruments in the line of SCIAMACHY and OMI have been providing very useful data on trace gases relevant in the ozone cycle, climate and air quality. With OMI the spatial resolution was improved considerably, allowing the data to be used more for air quality applications next to climate and ozone research. The success of SCIAMACHY and OMI lead to new initiatives of which the TROPOMI on ESA's Sentinel-5 Precursor satellite is the most advanced, as it has passed CDR status and is currently being built for launch in 2015. The paper gives an overview of the technological developments which enabled the success of the atmospheric solar-backscatter instruments and TROPOMI in particular, such as there are the free-form telescope design, Silicon immersed gratings and polarization scramblers. The paper presents in some detail the performances and status of the TROPOMI program. At the time of writing of the abstract we have a good overview of the performance features of the gratings, coatings and detectors. We have already seen that TROPOMI benefits from the fact that the design is very robust and thus capable to deal with possible issues. We are looking forward to instrument electrical-model tests during this summer and the start of flight model performance test and calibration at the end of the year. Next to the low Earth orbit instruments, the technology is being applied as well for geostationary orbit. Such instruments allow measuring regional daily cycles in air quality gases. The first is ESA's Sentinel 4, planned for launch in 2017 but there are also programs starting in Korea and the US. Having seen the development of SCIAMACHY towards OMI, TROPOMI and the later instruments, the paper addresses the potentials and limits of using the atmospheric solar-backscatter technique for other than scientific use, in particular for legislation enforcement.